

V. PHOTOATOMIC DATA

There are four photon transport libraries maintained by X-5 and distributed with MCNP: MCPLIB, MCPLIB02, MCPLIB03 and MCPLIB04. Their lineage is summarized below.

The official version of MCPLIB is unchanged since 1982.²⁵ Versions of MCPLIB existed prior to 1982. MCPLIB contains data from several sources. For Z equal 1 to 94 (excluding Z equal 84, 85, 87, 88, 89, 91, 93), the cross section data for incident energies from 1 keV to 100 MeV and all form factor data are from the ENDF/B-IV evaluation, which is available from RSICC as data package DLC-7e. The excluded elements are tabulated only on the energy range from 1 keV to 15 MeV and trace their cross-section data back to the Storm and Israel 1970 data compilation,²⁶ which is available from RSICC as data package DLC-15. The form factor data for the excluded elements is of forgotten origin. The fluorescence data were produced by Everett and Cashwell²⁷ from the Storm and Israel 1970 data, supplemented as necessary. MCPLIB does not contain momentum profile (CDBD) data.

MCPLIB02 was officially released in 1993²⁸ and was created as an extension to MCPLIB. The form factor and fluorescence data on MCPLIB and MCPLIB02 are identical. The cross section data below 10 MeV are also identical. From the maximum energy on the original MCPLIB table up to 100 GeV, the cross section data are derived from EPDL89.²⁹ Between 10 MeV and the highest energy of the MCPLIB data, the data are smoothly transitioned. MCPLIB02 does not contain momentum profile (CDBD) data.

MCPLIB03 was officially released in 2002³⁰ as another extension of the MCPLIB/MCPLIB02 data set. The cross section, form factor, and fluorescence data on MCPLIB02 and MCPLIB03 are identical. The only change is the addition of the momentum profile (CDBD) data, derived from the work of Biggs, Mendelsohn and Mann.³¹

MCPLIB04 was officially released in 2002.³² The cross section, form factor, and fluorescence data are all derived from the ENDF/B-VI.8 data library that are derived from EPDL97.³³ Cross section data are given for incident photon energies from 1 keV to 100 GeV. Fluorescence data are derived from the atomic relaxation data available in ENDF/B-VI.8 but use the storage and sampling scheme defined by Everett and Cashwell.²⁷ The momentum profile (CDBD) data are identical to the data found on MCPLIB03.³⁰

The entries in each of the columns of Table G .4 are described as follows:

ZAID	The nuclide identification number with the form ZZZAAA.nnX where ZZZ is the atomic number.
	AAA is always 000 for elemental photoatomic data.
	nn is the unique table identification number.
	X = P for continuous-energy neutron tables.
Library	Name of the library that contains the data file for that ZAID.

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Library Release Date	The date the library was officially released. This does not necessarily correspond to the source evaluation date; these tables contain data from many sources.
Length	The total length of a particular photoatomic table in words.
Number of Energies	The number of energy points (NE) on the grid used for the photoatomic cross sections for that data table. In general, a finer energy grid (or greater number of points) indicates a more accurate representation of the cross sections.
E_{max}	The maximum incident photon energy for that data table in GeV (multiply by 1000 to get the value in units of MeV). For all incident energies greater than E_{max} , MCNP assumes the last cross-section value given.
Cross Section Source	This entry indicates the source from which the cross-section data are derived. There are four sources for the cross-section data: <ol style="list-style-type: none">(1) S&I indicates data from the Storm and Israel 1970 compilation,(2) B-IV indicates data from ENDF/B-IV,(3) B-IV/89 indicates data from ENDF/B-IV merged with data from EPDL89, and(4) B/VI.8 indicates data from ENDF/B-VI release 8.
Form Factor Source	This entry indicates the source from which the form factor data are derived. There are three sources for the form factor data: <ol style="list-style-type: none">(1) Unknown indicates that data date back to unknown origins,(2) B/IV indicates data from ENDF/B-IV, and(3) B/VI.8 indicates data from ENDF/B-VI release 8.
Fluorescence Source	This entry indicates the source from which the fluorescence data are derived. There are two sources for the fluorescence data: <ol style="list-style-type: none">(1) E&C indicates data from Everett and Cashwell's original work, and(2) B/VI.8 indicates data in the Everett and Cashwell format derived from ENDF/B-VI release 8.
CDBD Source	This entry indicates the source from which the momentum profile (CDBD) data for Doppler broadening of the Compton scattered energy are derived. Currently the only source for the CDBD data is Biggs, Mendelsohn and Mann's 1975 compilation.

Table G .4
Continuous-Energy Photoatomic Data Libraries Maintained by X-5

ZAID	Library Name	Release Date	Length Words	NE	E _{max} (GeV)	CS Source	FF Source	Fluor. Source	CDBD Source
Z = 1 ***** Hydrogen *****									
1000.01p	mcplib	1982	389	43	0.1	B-IV	B-IV	E&C	n/a
1000.02p	mcplib02	1993	623	82	100	B-IV/89	B-IV	E&C	n/a
1000.03p	mcplib03	2002	722	82	100	B-IV/89	B-IV	E&C	BM&M
1000.04p	mcplib04	2002	1898	278	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 2 ***** Helium *****									
2000.01p	mcplib	1982	389	43	0.1	B-IV	B-IV	E&C	n/a
2000.02p	mcplib02	1993	623	82	100	B-IV/89	B-IV	E&C	n/a
2000.03p	mcplib03	2002	722	82	100	B-IV/89	B-IV	E&C	BM&M
2000.04p	mcplib04	2002	1970	290	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 3 ***** Lithium *****									
3000.01p	mcplib	1982	389	43	0.1	B-IV	B-IV	E&C	n/a
3000.02p	mcplib02	1993	623	82	100	B-IV/89	B-IV	E&C	n/a
3000.03p	mcplib03	2002	821	82	100	B-IV/89	B-IV	E&C	BM&M
3000.04p	mcplib04	2002	2339	335	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 4 ***** Beryllium *****									
4000.01p	mcplib	1982	389	43	0.1	B-IV	B-IV	E&C	n/a
4000.02p	mcplib02	1993	623	82	100	B-IV/89	B-IV	E&C	n/a
4000.03p	mcplib03	2002	821	82	100	B-IV/89	B-IV	E&C	BM&M
4000.04p	mcplib04	2002	2363	339	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 5 ***** Boron *****									
5000.01p	mcplib	1982	389	43	0.1	B-IV	B-IV	E&C	n/a
5000.02p	mcplib02	1993	623	82	100	B-IV/89	B-IV	E&C	n/a
5000.03p	mcplib03	2002	920	82	100	B-IV/89	B-IV	E&C	BM&M
5000.04p	mcplib04	2002	3116	448	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 6 ***** Carbon *****									
6000.01p	mcplib	1982	389	43	0.1	B-IV	B-IV	E&C	n/a
6000.02p	mcplib02	1993	623	82	100	B-IV/89	B-IV	E&C	n/a
6000.03p	mcplib03	2002	920	82	100	B-IV/89	B-IV	E&C	BM&M
6000.04p	mcplib04	2002	3152	454	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 7 ***** Nitrogen *****									
7000.01p	mcplib	1982	389	43	0.1	B-IV	B-IV	E&C	n/a
7000.02p	mcplib02	1993	623	82	100	B-IV/89	B-IV	E&C	n/a
7000.03p	mcplib03	2002	920	82	100	B-IV/89	B-IV	E&C	BM&M
7000.04p	mcplib04	2002	3194	461	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 8 ***** Oxygen *****									
8000.01p	mcplib	1982	389	43	0.1	B-IV	B-IV	E&C	n/a
8000.02p	mcplib02	1993	623	82	100	B-IV/89	B-IV	E&C	n/a
8000.03p	mcplib03	2002	920	82	100	B-IV/89	B-IV	E&C	BM&M
8000.04p	mcplib04	2002	3272	474	100	B-VI.8	B-VI.8	B-VI.8	BM&M

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Table G .4 (Cont.)
Continuous-Energy Photoatomic Data Libraries Maintained by X-5

<u>ZAID</u>	<u>Library Name</u>	<u>Release Date</u>	<u>Length Words</u>	<u>NE</u>	<u>E_{max} (GeV)</u>	<u>CS Source</u>	<u>FF Source</u>	<u>Fluor. Source</u>	<u>CDBD Source</u>
Z = 9 ***** Fluorine *****									
9000.01p	mcpplib	1982	389	43	0.1	B-IV	B-IV	E&C	n/a
9000.02p	mcpplib02	1993	623	82	100	B-IV/89	B-IV	E&C	n/a
9000.03p	mcpplib03	2002	920	82	100	B-IV/89	B-IV	E&C	BM&M
9000.04p	mcpplib04	2002	3206	463	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 10 ***** Neon *****									
10000.01p	mcpplib	1982	389	43	0.1	B-IV	B-IV	E&C	n/a
10000.02p	mcpplib02	1993	623	82	100	B-IV/89	B-IV	E&C	n/a
10000.03p	mcpplib03	2002	920	82	100	B-IV/89	B-IV	E&C	BM&M
10000.04p	mcpplib04	2002	3278	475	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 11 ***** Sodium *****									
11000.01p	mcpplib	1982	401	45	0.1	B-IV	B-IV	E&C	n/a
11000.02p	mcpplib02	1993	635	84	100	B-IV/89	B-IV	E&C	n/a
11000.03p	mcpplib03	2002	1031	84	100	B-IV/89	B-IV	E&C	BM&M
11000.04p	mcpplib04	2002	3995	578	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 12 ***** Magnesium *****									
12000.01p	mcpplib	1982	409	45	0.1	B-IV	B-IV	E&C	n/a
12000.02p	mcpplib02	1993	643	84	100	B-IV/89	B-IV	E&C	n/a
12000.03p	mcpplib03	2002	1039	84	100	B-IV/89	B-IV	E&C	BM&M
12000.04p	mcpplib04	2002	3781	541	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 13 ***** Aluminum *****									
13000.01p	mcpplib	1982	409	45	0.1	B-IV	B-IV	E&C	n/a
13000.02p	mcpplib02	1993	643	84	100	B-IV/89	B-IV	E&C	n/a
13000.03p	mcpplib03	2002	1138	84	100	B-IV/89	B-IV	E&C	BM&M
13000.04p	mcpplib04	2002	4846	702	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 14 ***** Silicon *****									
14000.01p	mcpplib	1982	409	45	0.1	B-IV	B-IV	E&C	n/a
14000.02p	mcpplib02	1993	643	84	100	B-IV/89	B-IV	E&C	n/a
14000.03p	mcpplib03	2002	1138	84	100	B-IV/89	B-IV	E&C	BM&M
14000.04p	mcpplib04	2002	4792	693	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 15 ***** Phosphorus *****									
15000.01p	mcpplib	1982	409	45	0.1	B-IV	B-IV	E&C	n/a
15000.02p	mcpplib02	1993	643	84	100	B-IV/89	B-IV	E&C	n/a
15000.03p	mcpplib03	2002	1138	84	100	B-IV/89	B-IV	E&C	BM&M
15000.04p	mcpplib04	2002	4498	644	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 16 ***** Sulfur *****									
16000.01p	mcpplib	1982	409	45	0.1	B-IV	B-IV	E&C	n/a
16000.02p	mcpplib02	1993	643	84	100	B-IV/89	B-IV	E&C	n/a
16000.03p	mcpplib03	2002	1138	84	100	B-IV/89	B-IV	E&C	BM&M
16000.04p	mcpplib04	2002	4654	670	100	B-VI.8	B-VI.8	B-VI.8	BM&M

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Z = 17 ***** Chlorine *****									
17000.01p	mcplib	1982	409	45	0.1	B-IV	B-IV	E&C	n/a
17000.02p	mcplib02	1993	643	84	100	B-IV/89	B-IV	E&C	n/a
17000.03p	mcplib03	2002	1138	84	100	B-IV/89	B-IV	E&C	BM&M
17000.04p	mcplib04	2002	4738	684	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 18 ***** Argon *****									
18000.01p	mcplib	1982	409	45	0.1	B-IV	B-IV	E&C	n/a
18000.02p	mcplib02	1993	643	84	100	B-IV/89	B-IV	E&C	n/a
18000.03p	mcplib03	2002	1138	84	100	B-IV/89	B-IV	E&C	BM&M
18000.04p	mcplib04	2002	4696	677	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 19 ***** Potassium *****									
19000.01p	mcplib	1982	409	45	0.1	B-IV	B-IV	E&C	n/a
19000.02p	mcplib02	1993	643	84	100	B-IV/89	B-IV	E&C	n/a
19000.03p	mcplib03	2002	1237	84	100	B-IV/89	B-IV	E&C	BM&M
19000.04p	mcplib04	2002	5047	719	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 20 ***** Calcium *****									
20000.01p	mcplib	1982	417	45	0.1	B-IV	B-IV	E&C	n/a
20000.02p	mcplib02	1993	651	84	100	B-IV/89	B-IV	E&C	n/a
20000.03p	mcplib03	2002	1245	84	100	B-IV/89	B-IV	E&C	BM&M
20000.04p	mcplib04	2002	5013	712	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 21 ***** Scandium *****									
21000.01p	mcplib	1982	417	45	0.1	B-IV	B-IV	E&C	n/a
21000.02p	mcplib02	1993	651	84	100	B-IV/89	B-IV	E&C	n/a
21000.03p	mcplib03	2002	1344	84	100	B-IV/89	B-IV	E&C	BM&M
21000.04p	mcplib04	2002	5532	782	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 22 ***** Titanium *****									
22000.01p	mcplib	1982	417	45	0.1	B-IV	B-IV	E&C	n/a
22000.02p	mcplib02	1993	651	84	100	B-IV/89	B-IV	E&C	n/a
22000.03p	mcplib03	2002	1344	84	100	B-IV/89	B-IV	E&C	BM&M
22000.04p	mcplib04	2002	5742	817	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 23 ***** Vanadium *****									
23000.01p	mcplib	1982	417	45	0.1	B-IV	B-IV	E&C	n/a
23000.02p	mcplib02	1993	651	84	100	B-IV/89	B-IV	E&C	n/a
23000.03p	mcplib03	2002	1344	84	100	B-IV/89	B-IV	E&C	BM&M
23000.04p	mcplib04	2002	5814	829	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 24 ***** Chromium *****									
24000.01p	mcplib	1982	417	45	0.1	B-IV	B-IV	E&C	n/a
24000.02p	mcplib02	1993	651	84	100	B-IV/89	B-IV	E&C	n/a
24000.03p	mcplib03	2002	1344	84	100	B-IV/89	B-IV	E&C	BM&M
24000.04p	mcplib04	2002	5682	807	100	B-VI.8	B-VI.8	B-VI.8	BM&M

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Z = 25 ***** Manganese *****									
25000.01p	mcpplib	1982	417	45	0.1	B-IV	B-IV	E&C	n/a
25000.02p	mcpplib02	1993	651	84	100	B-IV/89	B-IV	E&C	n/a
25000.03p	mcpplib03	2002	1344	84	100	B-IV/89	B-IV	E&C	BM&M
25000.04p	mcpplib04	2002	5598	793	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 26 ***** Iron *****									
26000.01p	mcpplib	1982	417	45	0.1	B-IV	B-IV	E&C	n/a
26000.02p	mcpplib02	1993	651	84	100	B-IV/89	B-IV	E&C	n/a
26000.03p	mcpplib03	2002	1344	84	100	B-IV/89	B-IV	E&C	BM&M
26000.04p	mcpplib04	2002	5718	813	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 27 ***** Cobalt *****									
27000.01p	mcpplib	1982	417	45	0.1	B-IV	B-IV	E&C	n/a
27000.02p	mcpplib02	1993	651	84	100	B-IV/89	B-IV	E&C	n/a
27000.03p	mcpplib03	2002	1344	84	100	B-IV/89	B-IV	E&C	BM&M
27000.04p	mcpplib04	2002	5436	766	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 28 ***** Nickel *****									
28000.01p	mcpplib	1982	429	47	0.1	B-IV	B-IV	E&C	n/a
28000.02p	mcpplib02	1993	663	86	100	B-IV/89	B-IV	E&C	n/a
28000.03p	mcpplib03	2002	1356	86	100	B-IV/89	B-IV	E&C	BM&M
28000.04p	mcpplib04	2002	5826	831	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 29 ***** Copper *****									
29000.01p	mcpplib	1982	429	47	0.1	B-IV	B-IV	E&C	n/a
29000.02p	mcpplib02	1993	663	86	100	B-IV/89	B-IV	E&C	n/a
29000.03p	mcpplib03	2002	1356	86	100	B-IV/89	B-IV	E&C	BM&M
29000.04p	mcpplib04	2002	5754	819	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 30 ***** Zinc *****									
30000.01p	mcpplib	1982	453	51	0.1	B-IV	B-IV	E&C	n/a
30000.02p	mcpplib02	1993	687	90	100	B-IV/89	B-IV	E&C	n/a
30000.03p	mcpplib03	2002	1380	90	100	B-IV/89	B-IV	E&C	BM&M
30000.04p	mcpplib04	2002	6288	908	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 31 ***** Gallium *****									
31000.01p	mcpplib	1982	457	51	0.1	B-IV	B-IV	E&C	n/a
31000.02p	mcpplib02	1993	691	90	100	B-IV/89	B-IV	E&C	n/a
31000.03p	mcpplib03	2002	1483	90	100	B-IV/89	B-IV	E&C	BM&M
31000.04p	mcpplib04	2002	6787	974	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 32 ***** Germanium *****									
32000.01p	mcpplib	1982	457	51	0.1	B-IV	B-IV	E&C	n/a
32000.02p	mcpplib02	1993	691	90	100	B-IV/89	B-IV	E&C	n/a
32000.03p	mcpplib03	2002	1483	90	100	B-IV/89	B-IV	E&C	BM&M
32000.04p	mcpplib04	2002	7027	1014	100	B-VI.8	B-VI.8	B-VI.8	BM&M

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<u>ZAID</u>	<u>Library Name</u>	<u>Release Date</u>	<u>Length Words</u>	<u>NE</u>	<u>E_{max} (GeV)</u>	<u>CS Source</u>	<u>FF Source</u>	<u>Fluor. Source</u>	<u>CDBD Source</u>
Z = 33 ***** Arsenic *****									
33000.01p	mcplib	1982	457	51	0.1	B-IV	B-IV	E&C	n/a
33000.02p	mcplib02	1993	691	90	100	B-IV/89	B-IV	E&C	n/a
33000.03p	mcplib03	2002	1483	90	100	B-IV/89	B-IV	E&C	BM&M
33000.04p	mcplib04	2002	6595	942	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 34 ***** Selenium *****									
34000.01p	mcplib	1982	457	51	0.1	B-IV	B-IV	E&C	n/a
34000.02p	mcplib02	1993	691	90	100	B-IV/89	B-IV	E&C	n/a
34000.03p	mcplib03	2002	1483	90	100	B-IV/89	B-IV	E&C	BM&M
34000.04p	mcplib04	2002	6655	952	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 35 ***** Bromine *****									
35000.01p	mcplib	1982	457	51	0.1	B-IV	B-IV	E&C	n/a
35000.02p	mcplib02	1993	691	90	100	B-IV/89	B-IV	E&C	n/a
35000.03p	mcplib03	2002	1483	90	100	B-IV/89	B-IV	E&C	BM&M
35000.04p	mcplib04	2002	6853	985	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 36 ***** Krypton *****									
36000.01p	mcplib	1982	457	51	0.1	B-IV	B-IV	E&C	n/a
36000.02p	mcplib02	1993	691	90	100	B-IV/89	B-IV	E&C	n/a
36000.03p	mcplib03	2002	1879	90	100	B-IV/89	B-IV	E&C	BM&M
36000.04p	mcplib04	2002	7177	973	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 37 ***** Rubidium *****									
37000.01p	mcplib	1982	461	51	0.1	B-IV	B-IV	E&C	n/a
37000.02p	mcplib02	1993	695	90	100	B-IV/89	B-IV	E&C	n/a
37000.03p	mcplib03	2002	1982	90	100	B-IV/89	B-IV	E&C	BM&M
37000.04p	mcplib04	2002	7364	987	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 38 ***** Strontium *****									
38000.01p	mcplib	1982	461	51	0.1	B-IV	B-IV	E&C	n/a
38000.02p	mcplib02	1993	695	90	100	B-IV/89	B-IV	E&C	n/a
38000.03p	mcplib03	2002	1982	90	100	B-IV/89	B-IV	E&C	BM&M
38000.04p	mcplib04	2002	7256	969	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 39 ***** Yttrium *****									
39000.01p	mcplib	1982	461	51	0.1	B-IV	B-IV	E&C	n/a
39000.02p	mcplib02	1993	695	90	100	B-IV/89	B-IV	E&C	n/a
39000.03p	mcplib03	2002	2081	90	100	B-IV/89	B-IV	E&C	BM&M
39000.04p	mcplib04	2002	7583	1007	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 40 ***** Zirconium *****									
40000.01p	mcplib	1982	461	51	0.1	B-IV	B-IV	E&C	n/a
40000.02p	mcplib02	1993	695	90	100	B-IV/89	B-IV	E&C	n/a
40000.03p	mcplib03	2002	2081	90	100	B-IV/89	B-IV	E&C	BM&M
40000.04p	mcplib04	2002	7703	1027	100	B-VI.8	B-VI.8	B-VI.8	BM&M

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Table G .4 (Cont.)
Continuous-Energy Photoatomic Data Libraries Maintained by X-5

<u>ZAID</u>	<u>Library Name</u>	<u>Release Date</u>	<u>Length Words</u>	<u>NE</u>	<u>E_{max} (GeV)</u>	<u>CS Source</u>	<u>FF Source</u>	<u>Fluor. Source</u>	<u>CDBD Source</u>
Z = 41 ***** Niobium *****									
41000.01p	mcpplib	1982	461	51	0.1	B-IV	B-IV	E&C	n/a
41000.02p	mcpplib02	1993	695	90	100	B-IV/89	B-IV	E&C	n/a
41000.03p	mcpplib03	2002	2081	90	100	B-IV/89	B-IV	E&C	BM&M
41000.04p	mcpplib04	2002	7667	1021	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 42 ***** Molybdenum *****									
42000.01p	mcpplib	1982	461	51	0.1	B-IV	B-IV	E&C	n/a
42000.02p	mcpplib02	1993	695	90	100	B-IV/89	B-IV	E&C	n/a
42000.03p	mcpplib03	2002	2180	90	100	B-IV/89	B-IV	E&C	BM&M
42000.04p	mcpplib04	2002	7592	992	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 43 ***** Technetium *****									
43000.01p	mcpplib	1982	461	51	0.1	B-IV	B-IV	E&C	n/a
43000.02p	mcpplib02	1993	695	90	100	B-IV/89	B-IV	E&C	n/a
43000.03p	mcpplib03	2002	2180	90	100	B-IV/89	B-IV	E&C	BM&M
43000.04p	mcpplib04	2002	7946	1051	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 44 ***** Ruthenium *****									
44000.01p	mcpplib	1982	461	51	0.1	B-IV	B-IV	E&C	n/a
44000.02p	mcpplib02	1993	695	90	100	B-IV/89	B-IV	E&C	n/a
44000.03p	mcpplib03	2002	2180	90	100	B-IV/89	B-IV	E&C	BM&M
44000.04p	mcpplib04	2002	7988	1058	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 45 ***** Rhodium *****									
45000.01p	mcpplib	1982	461	51	0.1	B-IV	B-IV	E&C	n/a
45000.02p	mcpplib02	1993	695	90	100	B-IV/89	B-IV	E&C	n/a
45000.03p	mcpplib03	2002	2180	90	100	B-IV/89	B-IV	E&C	BM&M
45000.04p	mcpplib04	2002	7856	1036	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 46 ***** Palladium *****									
46000.01p	mcpplib	1982	461	51	0.1	B-IV	B-IV	E&C	n/a
46000.02p	mcpplib02	1993	695	90	100	B-IV/89	B-IV	E&C	n/a
46000.03p	mcpplib03	2002	2081	90	100	B-IV/89	B-IV	E&C	BM&M
46000.04p	mcpplib04	2002	7595	1009	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 47 ***** Silver *****									
47000.01p	mcpplib	1982	461	51	0.1	B-IV	B-IV	E&C	n/a
47000.02p	mcpplib02	1993	695	90	100	B-IV/89	B-IV	E&C	n/a
47000.03p	mcpplib03	2002	2180	90	100	B-IV/89	B-IV	E&C	BM&M
47000.04p	mcpplib04	2002	7772	1022	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 48 ***** Cadmium *****									
48000.01p	mcpplib	1982	461	51	0.1	B-IV	B-IV	E&C	n/a
48000.02p	mcpplib02	1993	695	90	100	B-IV/89	B-IV	E&C	n/a
48000.03p	mcpplib03	2002	2180	90	100	B-IV/89	B-IV	E&C	BM&M
48000.04p	mcpplib04	2002	7700	1010	100	B-VI.8	B-VI.8	B-VI.8	BM&M

Table G .4 (Cont.)
Continuous-Energy Photoatomic Data Libraries Maintained by X-5

<u>ZAID</u>	<u>Library Name</u>	<u>Release Date</u>	<u>Length Words</u>	<u>NE</u>	<u>E_{max} (GeV)</u>	<u>CS Source</u>	<u>FF Source</u>	<u>Fluor Source</u>	<u>CDBD Source</u>
Z = 49 ***** Indium *****									
49000.01p	mcplib	1982	461	51	0.1	B-IV	B-IV	E&C	n/a
49000.02p	mcplib02	1993	695	90	100	B-IV/89	B-IV	E&C	n/a
49000.03p	mcplib03	2002	2279	90	100	B-IV/89	B-IV	E&C	BM&M
49000.04p	mcplib04	2002	8291	1092	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 50 ***** Tin *****									
50000.01p	mcplib	1982	461	51	0.1	B-IV	B-IV	E&C	n/a
50000.02p	mcplib02	1993	695	90	100	B-IV/89	B-IV	E&C	n/a
50000.03p	mcplib03	2002	2279	90	100	B-IV/89	B-IV	E&C	BM&M
50000.04p	mcplib04	2002	8039	1050	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 51 ***** Antimony *****									
51000.01p	mcplib	1982	461	51	0.1	B-IV	B-IV	E&C	n/a
51000.02p	mcplib02	1993	695	90	100	B-IV/89	B-IV	E&C	n/a
51000.03p	mcplib03	2002	2378	90	100	B-IV/89	B-IV	E&C	BM&M
51000.04p	mcplib04	2002	8414	1096	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 52 ***** Tellurium *****									
52000.01p	mcplib	1982	473	53	0.1	B-IV	B-IV	E&C	n/a
52000.02p	mcplib02	1993	707	92	100	B-IV/89	B-IV	E&C	n/a
52000.03p	mcplib03	2002	2390	92	100	B-IV/89	B-IV	E&C	BM&M
52000.04p	mcplib04	2002	8162	1054	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 53 ***** Iodine *****									
53000.01p	mcplib	1982	473	53	0.1	B-IV	B-IV	E&C	n/a
53000.02p	mcplib02	1993	707	92	100	B-IV/89	B-IV	E&C	n/a
53000.03p	mcplib03	2002	2390	92	100	B-IV/89	B-IV	E&C	BM&M
53000.04p	mcplib04	2002	8492	1109	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 54 ***** Xenon *****									
54000.01p	mcplib	1982	473	53	0.1	B-IV	B-IV	E&C	n/a
54000.02p	mcplib02	1993	707	92	100	B-IV/89	B-IV	E&C	n/a
54000.03p	mcplib03	2002	2390	92	100	B-IV/89	B-IV	E&C	BM&M
54000.04p	mcplib04	2002	8324	1081	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 55 ***** Cesium *****									
55000.01p	mcplib	1982	497	57	0.1	B-IV	B-IV	E&C	n/a
55000.02p	mcplib02	1993	731	96	100	B-IV/89	B-IV	E&C	n/a
55000.03p	mcplib03	2002	2513	96	100	B-IV/89	B-IV	E&C	BM&M
55000.04p	mcplib04	2002	8417	1080	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 56 ***** Barium *****									
56000.01p	mcplib	1982	497	57	0.1	B-IV	B-IV	E&C	n/a
56000.02p	mcplib02	1993	731	96	100	B-IV/89	B-IV	E&C	n/a
56000.03p	mcplib03	2002	2513	96	100	B-IV/89	B-IV	E&C	BM&M
56000.04p	mcplib04	2002	8465	1088	100	B-VI.8	B-VI.8	B-VI.8	BM&M

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Table G .4 (Cont.)
Continuous-Energy Photoatomic Data Libraries Maintained by X-5

<u>ZAID</u>	<u>Library Name</u>	<u>Release Date</u>	<u>Length Words</u>	<u>NE</u>	<u>E_{max} (GeV)</u>	<u>CS Source</u>	<u>FF Source</u>	<u>Fluor. Source</u>	<u>CDBD Source</u>
Z = 57 ***** Lanthanum *****									
57000.01p	mcplib	1982	497	57	0.1	B-IV	B-IV	E&C	n/a
57000.02p	mcplib02	1993	731	96	100	B-IV/89	B-IV	E&C	n/a
57000.03p	mcplib03	2002	2612	96	100	B-IV/89	B-IV	E&C	BM&M
57000.04p	mcplib04	2002	8744	1118	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 58 ***** Cerium *****									
58000.01p	mcplib	1982	497	57	0.1	B-IV	B-IV	E&C	n/a
58000.02p	mcplib02	1993	731	96	100	B-IV/89	B-IV	E&C	n/a
58000.03p	mcplib03	2002	2711	96	100	B-IV/89	B-IV	E&C	BM&M
58000.04p	mcplib04	2002	9173	1173	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 59 ***** Praseodymium *****									
59000.01p	mcplib	1982	497	57	0.1	B-IV	B-IV	E&C	n/a
59000.02p	mcplib02	1993	731	96	100	B-IV/89	B-IV	E&C	n/a
59000.03p	mcplib03	2002	2612	96	100	B-IV/89	B-IV	E&C	BM&M
59000.04p	mcplib04	2002	8750	1119	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 60 ***** Neodymium *****									
60000.01p	mcplib	1982	509	59	0.1	B-IV	B-IV	E&C	n/a
60000.02p	mcplib02	1993	743	98	100	B-IV/89	B-IV	E&C	n/a
60000.03p	mcplib03	2002	2624	98	100	B-IV/89	B-IV	E&C	BM&M
60000.04p	mcplib04	2002	9362	1221	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 61 ***** Promethium *****									
61000.01p	mcplib	1982	521	61	0.1	B-IV	B-IV	E&C	n/a
61000.02p	mcplib02	1993	755	100	100	B-IV/89	B-IV	E&C	n/a
61000.03p	mcplib03	2002	2636	100	100	B-IV/89	B-IV	E&C	BM&M
61000.04p	mcplib04	2002	9350	1219	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 62 ***** Samarium *****									
62000.01p	mcplib	1982	521	61	0.1	B-IV	B-IV	E&C	n/a
62000.02p	mcplib02	1993	755	100	100	B-IV/89	B-IV	E&C	n/a
62000.03p	mcplib03	2002	2636	100	100	B-IV/89	B-IV	E&C	BM&M
62000.04p	mcplib04	2002	9374	1223	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 63 ***** Europium *****									
63000.01p	mcplib	1982	521	61	0.1	B-IV	B-IV	E&C	n/a
63000.02p	mcplib02	1993	755	100	100	B-IV/89	B-IV	E&C	n/a
63000.03p	mcplib03	2002	2735	100	100	B-IV/89	B-IV	E&C	BM&M
63000.04p	mcplib04	2002	9323	1198	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 64 ***** Gadolinium *****									
64000.01p	mcplib	1982	521	61	0.1	B-IV	B-IV	E&C	n/a
64000.02p	mcplib02	1993	755	100	100	B-IV/89	B-IV	E&C	n/a
64000.03p	mcplib03	2002	2834	100	100	B-IV/89	B-IV	E&C	BM&M
64000.04p	mcplib04	2002	9560	1221	100	B-VI.8	B-VI.8	B-VI.8	BM&M

Table G .4 (Cont.)
Continuous-Energy Photoatomic Data Libraries Maintained by X-5

<u>ZAID</u>	<u>Library Name</u>	<u>Release Date</u>	<u>Length Words</u>	<u>NE</u>	<u>E_{max} (GeV)</u>	<u>CS Source</u>	<u>FF Source</u>	<u>Fluor. Source</u>	<u>CDBD Source</u>
Z = 65 ***** Terbium *****									
65000.01p	mcplib	1982	521	61	0.1	B-IV	B-IV	E&C	n/a
65000.02p	mcplib02	1993	755	100	100	B-IV/89	B-IV	E&C	n/a
65000.03p	mcplib03	2002	2735	100	100	B-IV/89	B-IV	E&C	BM&M
65000.04p	mcplib04	2002	9143	1168	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 66 ***** Dysprosium *****									
66000.01p	mcplib	1982	521	61	0.1	B-IV	B-IV	E&C	n/a
66000.02p	mcplib02	1993	755	100	100	B-IV/89	B-IV	E&C	n/a
66000.03p	mcplib03	2002	2735	100	100	B-IV/89	B-IV	E&C	BM&M
66000.04p	mcplib04	2002	9479	1224	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 67 ***** Holmium *****									
67000.01p	mcplib	1982	521	61	0.1	B-IV	B-IV	E&C	n/a
67000.02p	mcplib02	1993	755	100	100	B-IV/89	B-IV	E&C	n/a
67000.03p	mcplib03	2002	2735	100	100	B-IV/89	B-IV	E&C	BM&M
67000.04p	mcplib04	2002	9419	1214	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 68 ***** Erbium *****									
68000.01p	mcplib	1982	521	61	0.1	B-IV	B-IV	E&C	n/a
68000.02p	mcplib02	1993	755	100	100	B-IV/89	B-IV	E&C	n/a
68000.03p	mcplib03	2002	2735	100	100	B-IV/89	B-IV	E&C	BM&M
68000.04p	mcplib04	2002	9233	1183	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 69 ***** Thulium *****									
69000.01p	mcplib	1982	521	61	0.1	B-IV	B-IV	E&C	n/a
69000.02p	mcplib02	1993	755	100	100	B-IV/89	B-IV	E&C	n/a
69000.03p	mcplib03	2002	2735	100	100	B-IV/89	B-IV	E&C	BM&M
69000.04p	mcplib04	2002	9473	1223	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 70 ***** Ytterbium *****									
70000.01p	mcplib	1982	521	61	0.1	B-IV	B-IV	E&C	n/a
70000.02p	mcplib02	1993	755	100	100	B-IV/89	B-IV	E&C	n/a
70000.03p	mcplib03	2002	2735	100	100	B-IV/89	B-IV	E&C	BM&M
70000.04p	mcplib04	2002	9539	1234	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 71 ***** Lutetium *****									
71000.01p	mcplib	1982	521	61	0.1	B-IV	B-IV	E&C	n/a
71000.02p	mcplib02	1993	755	100	100	B-IV/89	B-IV	E&C	n/a
71000.03p	mcplib03	2002	2834	100	100	B-IV/89	B-IV	E&C	BM&M
71000.04p	mcplib04	2002	9914	1280	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 72 ***** Hafnium *****									
72000.01p	mcplib	1982	521	61	0.1	B-IV	B-IV	E&C	n/a
72000.02p	mcplib02	1993	755	100	100	B-IV/89	B-IV	E&C	n/a
72000.03p	mcplib03	2002	2834	100	100	B-IV/89	B-IV	E&C	BM&M
72000.04p	mcplib04	2002	9932	1283	100	B-VI.8	B-VI.8	B-VI.8	BM&M

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Table G .4 (Cont.)
Continuous-Energy Photoatomic Data Libraries Maintained by X-5

<u>ZAID</u>	<u>Library Name</u>	<u>Release Date</u>	<u>Length Words</u>	<u>NE</u>	<u>E_{max} (GeV)</u>	<u>CS Source</u>	<u>FF Source</u>	<u>Fluor. Source</u>	<u>CDBD Source</u>
Z = 73 ***** Tantalum *****									
73000.01p	mcpplib	1982	521	61	0.1	B-IV	B-IV	E&C	n/a
73000.02p	mcpplib02	1993	755	100	100	B-IV/89	B-IV	E&C	n/a
73000.03p	mcpplib03	2002	2834	100	100	B-IV/89	B-IV	E&C	BM&M
73000.04p	mcpplib04	2002	9698	1244	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 74 ***** Tungsten *****									
74000.01p	mcpplib	1982	521	61	0.1	B-IV	B-IV	E&C	n/a
74000.02p	mcpplib02	1993	755	100	100	B-IV/89	B-IV	E&C	n/a
74000.03p	mcpplib03	2002	2834	100	100	B-IV/89	B-IV	E&C	BM&M
74000.04p	mcpplib04	2002	9716	1247	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 75 ***** Rhenium *****									
75000.01p	mcpplib	1982	521	61	0.1	B-IV	B-IV	E&C	n/a
75000.02p	mcpplib02	1993	755	100	100	B-IV/89	B-IV	E&C	n/a
75000.03p	mcpplib03	2002	2933	100	100	B-IV/89	B-IV	E&C	BM&M
75000.04p	mcpplib04	2002	9797	1244	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 76 ***** Osmium *****									
76000.01p	mcpplib	1982	521	61	0.1	B-IV	B-IV	E&C	n/a
76000.02p	mcpplib02	1993	755	100	100	B-IV/89	B-IV	E&C	n/a
76000.03p	mcpplib03	2002	2933	100	100	B-IV/89	B-IV	E&C	BM&M
76000.04p	mcpplib04	2002	9977	1274	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 77 ***** Iridium *****									
77000.01p	mcpplib	1982	521	61	0.1	B-IV	B-IV	E&C	n/a
77000.02p	mcpplib02	1993	755	100	100	B-IV/89	B-IV	E&C	n/a
77000.03p	mcpplib03	2002	2933	100	100	B-IV/89	B-IV	E&C	BM&M
77000.04p	mcpplib04	2002	9665	1222	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 78 ***** Platinum *****									
78000.01p	mcpplib	1982	521	61	0.1	B-IV	B-IV	E&C	n/a
78000.02p	mcpplib02	1993	755	100	100	B-IV/89	B-IV	E&C	n/a
78000.03p	mcpplib03	2002	2933	100	100	B-IV/89	B-IV	E&C	BM&M
78000.04p	mcpplib04	2002	9377	1174	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 79 ***** Gold *****									
79000.01p	mcpplib	1982	521	61	0.1	B-IV	B-IV	E&C	n/a
79000.02p	mcpplib02	1993	755	100	100	B-IV/89	B-IV	E&C	n/a
79000.03p	mcpplib03	2002	2933	100	100	B-IV/89	B-IV	E&C	BM&M
79000.04p	mcpplib04	2002	9881	1258	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 80 ***** Mercury *****									
80000.01p	mcpplib	1982	521	61	0.1	B-IV	B-IV	E&C	n/a
80000.02p	mcpplib02	1993	755	100	100	B-IV/89	B-IV	E&C	n/a
80000.03p	mcpplib03	2002	2933	100	100	B-IV/89	B-IV	E&C	BM&M
80000.04p	mcpplib04	2002	9281	1158	100	B-VI.8	B-VI.8	B-VI.8	BM&M

Table G .4 (Cont.)
Continuous-Energy Photoatomic Data Libraries Maintained by X-5

<u>ZAID</u>	<u>Library Name</u>	<u>Release Date</u>	<u>Length Words</u>	<u>NE</u>	<u>E_{max} (GeV)</u>	<u>CS Source</u>	<u>FF Source</u>	<u>Fluor. Source</u>	<u>CDBD Source</u>
Z = 81 ***** Thallium *****									
81000.01p	mcplib	1982	521	61	0.1	B-IV	B-IV	E&C	n/a
81000.02p	mcplib02	1993	755	100	100	B-IV/89	B-IV	E&C	n/a
81000.03p	mcplib03	2002	3032	100	100	B-IV/89	B-IV	E&C	BM&M
81000.04p	mcplib04	2002	10142	1285	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 82 ***** Lead *****									
82000.01p	mcplib	1982	521	61	0.1	B-IV	B-IV	E&C	n/a
82000.02p	mcplib02	1993	755	100	100	B-IV/89	B-IV	E&C	n/a
82000.03p	mcplib03	2002	3032	100	100	B-IV/89	B-IV	E&C	BM&M
82000.04p	mcplib04	2002	10010	1263	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 83 ***** Bismuth *****									
83000.01p	mcplib	1982	521	61	0.1	B-IV	B-IV	E&C	n/a
83000.02p	mcplib02	1993	755	100	100	B-IV/89	B-IV	E&C	n/a
83000.03p	mcplib03	2002	3131	100	100	B-IV/89	B-IV	E&C	BM&M
83000.04p	mcplib04	2002	10373	1307	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 84 ***** Polonium *****									
84000.01p	mcplib	1982	467	52	0.015	DLC-15	Unknown	E&C	n/a
84000.02p	mcplib02	1993	749	99	100	S&I/89	Unknown	E&C	n/a
84000.03p	mcplib03	2002	3125	99	100	S&I/89	Unknown	E&C	BM&M
84000.04p	mcplib04	2002	10247	1286	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 85 ***** Astatine *****									
85000.01p	mcplib	1982	479	54	0.015	DLC-15	Unknown	E&C	n/a
85000.02p	mcplib02	1993	761	101	100	S&I/89	Unknown	E&C	n/a
85000.03p	mcplib03	2002	3137	101	100	S&I/89	Unknown	E&C	BM&M
85000.04p	mcplib04	2002	10463	1322	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 86 ***** Radon *****									
86000.01p	mcplib	1982	533	63	0.1	B-IV	B-IV	E&C	n/a
86000.02p	mcplib02	1993	767	102	100	B-IV/89	B-IV	E&C	n/a
86000.03p	mcplib03	2002	3143	102	100	B-IV/89	B-IV	E&C	BM&M
86000.04p	mcplib04	2002	10325	1299	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 87 ***** Francium *****									
87000.01p	mcplib	1982	479	54	0.015	S&I	Unknown	E&C	n/a
87000.02p	mcplib02	1993	761	101	100	S&I/89	Unknown	E&C	n/a
87000.03p	mcplib03	2002	3236	101	100	S&I/89	Unknown	E&C	BM&M
87000.04p	mcplib04	2002	10532	1317	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 88 ***** Radium *****									
88000.01p	mcplib	1982	479	54	0.015	S&I	Unknown	E&C	n/a
88000.02p	mcplib02	1993	761	101	100	S&I/89	Unknown	E&C	n/a
88000.03p	mcplib03	2002	3236	101	100	S&I/89	Unknown	E&C	BM&M
88000.04p	mcplib04	2002	10346	1286	100	B-VI.8	B-VI.8	B-VI.8	BM&M

PHOTOATOMIC DATA

Table G .4 (Cont.)
Continuous-Energy Photoatomic Data Libraries Maintained by X-5

<u>ZAID</u>	<u>Library Name</u>	<u>Release Date</u>	<u>Length Words</u>	<u>NE</u>	<u>E_{max} (GeV)</u>	<u>CS Source</u>	<u>FF Source</u>	<u>Fluor. Source</u>	<u>CDBD Source</u>
Z = 89 ***** Actinium *****									
89000.01p	mcplib	1982	479	54	0.015	S&I	Unknown	E&C	n/a
89000.02p	mcplib02	1993	761	101	100	S&I/89	Unknown	E&C	n/a
89000.03p	mcplib03	2002	3335	101	100	S&I/89	Unknown	E&C	BM&M
89000.04p	mcplib04	2002	10133	1234	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 90 ***** Thorium *****									
90000.01p	mcplib	1982	533	63	0.1	B-IV	B-IV	E&C	n/a
90000.02p	mcplib02	1993	767	102	100	B-IV/89	B-IV	E&C	n/a
90000.03p	mcplib03	2002	3341	102	100	B-IV/89	B-IV	E&C	BM&M
90000.04p	mcplib04	2002	10565	1306	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 91 ***** Protactinium *****									
91000.01p	mcplib	1982	479	54	0.015	S&I	Unknown	E&C	n/a
91000.02p	mcplib02	1993	761	101	100	S&I/89	Unknown	E&C	n/a
91000.03p	mcplib03	2002	3434	101	100	S&I/89	Unknown	E&C	BM&M
91000.04p	mcplib04	2002	10670	1307	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 92 ***** Uranium *****									
92000.01p	mcplib	1982	533	63	0.1	B-IV	B-IV	E&C	n/a
92000.02p	mcplib02	1993	767	102	100	B-IV/89	B-IV	E&C	n/a
92000.03p	mcplib03	2002	3440	102	100	B-IV/89	B-IV	E&C	BM&M
92000.04p	mcplib04	2002	10808	1330	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 93 ***** Neptunium *****									
93000.01p	mcplib	1982	479	54	0.015	S&I	Unknown	E&C	n/a
93000.02p	mcplib02	1993	761	101	100	S&I/89	Unknown	E&C	n/a
93000.03p	mcplib03	2002	3434	101	100	S&I/89	Unknown	E&C	BM&M
93000.04p	mcplib04	2002	11120	1382	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 94 ***** Plutonium *****									
94000.01p	mcplib	1982	533	63	0.1	B-IV	B-IV	E&C	n/a
94000.02p	mcplib02	1993	767	102	100	B-IV/89	B-IV	E&C	n/a
94000.03p	mcplib03	2002	3341	102	100	B-IV/89	B-IV	E&C	BM&M
94000.04p	mcplib04	2002	10451	1287	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 95 ***** Americium *****									
95000.04p	mcplib04	2002	10640	1302	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 96 ***** Curium *****									
96000.04p	mcplib04	2002	10421	1249	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 97 ***** Berkelium *****									
97000.04p	mcplib04	2002	10478	1275	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 98 ***** Californium *****									
98000.04p	mcplib04	2002	10634	1301	100	B-VI.8	B-VI.8	B-VI.8	BM&M

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<u>ZAID</u>	<u>Library Name</u>	<u>Release Date</u>	<u>Length Words</u>	<u>NE</u>	<u>E_{max} (GeV)</u>	<u>CS Source</u>	<u>FF Source</u>	<u>Fluor. Source</u>	<u>CDBD Source</u>
Z = 99 ***** Einsteinium *****									
99000.04p	mcplib04	2002	11126	1383	100	B-VI.8	B-VI.8	B-VI.8	BM&M
Z = 100 ***** Fermium *****									
100000.04p	mcplib04	2002	10916	1348	100	B-VI.8	B-VI.8	B-VI.8	BM&M